Second
Five-Year Review Report

Pester Refinery Site
El Dorado, Kansas

September 2004

Environmental Protection Agency
Region VII
Kansas City, Kansas

Approved by:

Cecilia Tapia
Director
Superfund Division

Date:

9/15/04

Contents

Attachments

Abbreviations and Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
BAT/BMP	Best Available Technology/Best Management Practices
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
HASP	Health and Safety Plan
KDHE	Kansas Department of Health and Environment
MCL	Maximum Contaminant Level
MG/KG	Milligrams per kilogram
MG/L	Milligrams per liter
MSL	Mean Sea Level
NCP	National Oil and Hazardous Substances Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OSWER	Office of Solid Waste and Emergency Response
PPB	Parts per billion
PPM	Parts per million
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SAL	State Action Level
UG/KG	Micrograms per kilogram
UG/L	Micrograms per liter
UST	Underground Storage Tank
VOC	Volatile Organic Compound

Executive Summary

The second five-year review of the Pester Refinery site, located north of the city of El

Dorado, in Butler County, Kansas, has been completed, including a site inspection on July 20, 2004. The site includes two operable units, OU1, the soil and sludge operable unit, and OU2, the groundwater unit. The remedy for cleanup of OU1 was explained in a Record of Decision (ROD) signed on September 30, 1992, and included removal of the source of contamination, the sludge contained in an impoundment (burn pond), *in-situ* bioremediation, and soil-flushing. The OU2 remedy for groundwater contamination onsite included quarterly groundwater monitoring and sediment monitoring which was described in a ROD dated September 29, 1998. The former refinery is located west of the site. The site boundary includes only the burn pond, which was built by Fina Oil and Chemical Company (Fina) in 1958 in order to dispose of petroleum waste products generated by refinery operations. The pond (three inter-connected ponds) was used to store various refinery byproducts such as slop oil emulsion solids, API separator sludge, and heat exchanger bundle cleaning sludge; and a common practice for Fina was to ignite these wastes. An open interceptor trench was installed in the late 1950s or early 1960s to intercept seepage from the burn pond to the West Branch Walnut River. Although water was collected and pumped back to the pond, the trench occasionally overflowed or was inundated and carried contaminants into the river. In 1977, Pester purchased the refinery from Fina and continued refinery operations until filing for bankruptcy in 1985. Following Pester's bankruptcy, Coastal Derby Refining Company purchased the refinery with the exception of the tract of land containing the burn pond which is still owned by Pester. In 1986, the Kansas Department of Health and Environment (KDHE) issued an Administrative Order requiring Pester to conduct a site investigation. The Pester Refinery site was placed on the National Priorities List (NPL) in 1989. A Consent Order was signed in 1990 between KDHE and responsible parties, Pester and Fina, to conduct a Remedial Investigation (RI) and Feasibility Study (FS). A subsurface interceptor trench was constructed during 1992 on the north and east sides of the burn pond to prevent the seepage of contamination from the burn pond into the river. In 1993, KDHE, Fina, and Pester entered into a Consent Order for completion of the Remedial Design (RD) and Remedial Action (RA) for OU1. Fina and KDHE signed a Consent Order for the RI/FS for OU2 in 1993. The RA for OU1 was initiated by Fina in 1994. In 1996, the open interceptor trench was replaced by Fina when KDHE approved the trench extension of the northwestern end of the subsurface interceptor trench. Water from the trench is treated by the water treatment system which consists of oil/water separation and filtration and is discharged under a National Permit Discharge Elimination System (NPDES) permit. The maintenance of the site and the quarterly groundwater monitoring are currently conducted by ATOFINA Petrochemicals, Inc. (ATOFINA) (formerly Fina) to ensure protectiveness of the remedy. Although the bioremediation remedy has demonstrated success in removing contaminants from the site, the 2001 bioremediation report indicated a decrease in the rate of contaminant removal and it was suggested by ATOFINA that cleanup levels might not be attainable with the bioremediation remedy. ATOFINA recommended an investigation for a new remedy. A Proposed Plan for a ROD Amendment is in preparation. ATOFINA has conducted a phase 1 treatability study and pilot study and initiated the phase 2 treatability study for design admixtures for a proposed solidification remedy.

Location Map

SITE LOCATION MAP
PESTER BURN POND SITE
EL DORADO, KANSAS

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Pester Refinery Company Site		
EPA ID *(from WasteLAN)*: KSD000829846		
Region: VII	**State: KS**	**City/County: El Dorado/Butler**
SITE STATUS		
NPL status: ☐X Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ☐ Operating ☐X Complete		
Multiple OUs? ☐X YES ☐ NO		**Construction completion date:** _09 / 08_ / 1999__
Has site been put into reuse? ☐ YES ☐X NO		
REVIEW STATUS		
Reviewing agency: ☐X EPA ☐ State ☐ Tribe ☐ Other Federal Agency		
Author name: Catherine Barrett		
Author title: Remedial Project Manager		**Author affiliation: EPA Region VII**
Review period: _10 /23/ 2003__ to _09 /30/ 2004___		
Date(s) of site inspection: _07 / 20_ / 2004____		
Type of review: ☐x Statutory ☐ Policy (☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion)		
Review number: ☐ 1 (first) ☐X 2 (second) ☐ 3 (third) ☐ Other (specify)		
Triggering action: ☐ RA Onsite Construction ☐ RA Start ☐ Construction Completion ☐X Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date *(from WasteLAN)*: 09_ /15__ / 1999__		
Due date *(five years after triggering action date)*: 09_ / 15_ / 2004___		

Five-Year Review Summary

Recommendations and Follow-up Actions:

The Pester Refinery site should continue to be addressed by ATOFINA, the Potentially Responsible Party (PRP), in accordance with the Consent Agreements as modified to incorporate any subsequent changes to the remedy.

Protectiveness Statements:

All immediate threats at the site have been addressed, and the remedy for the site will be protective of human health and the environment when the proposed solidification remedy is complete.

Long-term protectiveness of the remedial action continues to be evaluated and monitored with quarterly groundwater sampling and quarterly maintenance inspections of the site.

I. Introduction

The Environmental Protection Agency (EPA), in cooperation with the Kansas Department of Health and Environment (KDHE), has conducted a five-year review of the Superfund remedial action implemented at the Pester Refinery site near the city of El Dorado in Butler County, Kansas.

The five-year review report is completed pursuant to Section 121 (c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA); to Section 300.430 (f) (4) (ii) of the National Oil and Hazardous Substances Contingency Plan (NCP); and pursuant to EPA, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7 - 03B-P, Comprehensive Five-Year Review Guidance (June 2001).

The purpose of the five-year review is to ensure that the remedy at the site remains protective of human health and the environment. The five-year review report identifies any deficiencies found and provides recommendations.

This five-year review is required by statute and is implemented consistent with the CERCLA and the NCP. CERCLA Section 121 (c), as amended, states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.*

The NCP Part 300.430 (f) (4) (ii) of the Code of Federal Regulations (CFR) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.*

For sites with multiple operable units, one five-year review is conducted for the combined operable units. The first five-year review for OU1 and OU2 was conducted five years from the initiation of the remedial action for OU1. This is the second five-year review for the Pester Refinery site. The triggering action for this review is the first five-year review.

II. Site Chronology

Chronology of Site Events for OU1 and OU2

Date	Event
1980	Preliminary Assessment
1981	Site Inspection
06/24/1988	Proposal to NPL
03/31/1989	Final Listing on NPL
1989	PRP Search
1989	Notice letters
1990, 1993	State Orders
1992	PRP RI/FS for OU1
1992	Record of Decision for OU1
1993, 1998, 2000	Explanation of Significant Differences (ESDs)
1993	State Consent Decree
1994	PRP Remedial Design
1994	PRP Remedial Action
1998	PRP RI/FS for OU2
1998	Record of Decision for OU2
09/08/1999	Preliminary Close-Out Report
09/16/1999	First Five-Year Review Report

III. Background

Physical Characteristics

The Pester Refinery site is located on a 10-acre tract to the north and west of the city of El Dorado, Butler County, Kansas. The site is comprised of a burn pond in which petroleum wastes were ignited as a common practice in the refinery operations. The refinery which is adjacent to the west of the site is not a part of the site. The West Branch Walnut River flows along the north and east edge of the site. To the south of the burn pond is property owned by El Paso (formerly Coastal Refining and Marketing, Inc.) (Coastal). The site is located in the southwest quarter of Section 25, Township 25 South, Range 5 East, Butler County, Kansas.

The site lies within the Osage Plains section (Flint Hills Upland subsection) of the Central Lowland Physiographic province. In general, the topography is characterized by flat-topped, steep-sided hills capped by chert-bearing limestone. The site is underlain by terrace and alluvial sediments of Pleistocene-Recent age deposited by the West Branch Walnut River and Permian age units of the Barneston Limestone Formation. There are three aquifers beneath the site: (1) an alluvial aquifer ranging in thickness from 2 to 17 feet and consisting of clayey silts and fine sands with local gravel beds; (2) an upper limestone bedrock aquifer (Fort Riley Limestone Member of the Barneston Limestone) consisting of thin to massively bedded fossiliferous limestone and clayey shale; and, (3) a lower limestone bedrock aquifer (Florence Limestone Member of the Barneston Limestone) consisting of limestone with interbedded chert. There is a confining calcareous shale (Oketo Shale Member) separating the upper and lower bedrock aquifers.

Groundwater in the region is drawn primarily from the shallow bedrock aquifers (Fort Riley Limestone and Florence Limestone), with lesser amounts from the shallow alluvial aquifer because that aquifer is less commonly present. The bedrock aquifers are characterized by jointed and fractured limestone that may be confined.

The direction of groundwater flow in the alluvial aquifer at the site is generally northeast and east toward the river with the possibility of some radial flow to the south and southwest of the burn pond. Data suggest that the alluvial aquifer and the Fort Riley Limestone aquifer are hydraulically connected and are locally recharged by the ponds on the site. Groundwater within the Fort Riley Limestone aquifer is interpreted to flow northeast and east from the ponds with partial discharge into the West Branch Walnut River. Groundwater in the Florence Limestone aquifer is interpreted to flow eastward from the site.

Land and Resource Use

Industrial and agricultural lands surround the site. West of the site is the former refinery owned and operated by El Paso and a Santa Fe Railroad spur that services the refinery.

El Paso currently operates a wastewater treatment facility at the former refinery. Asphalt blending operations are also conducted at the former refinery. The West Branch Walnut River flows along the north and east edge of the site. Agricultural land lies to the north and east of the site across the river.

History of Contamination

The refinery occupying the area immediately west of the site was constructed in 1917, soon after the discovery of oil in El Dorado in 1915. The refinery and surrounding area were purchased by Fina Oil and Chemical Company in 1958. The burn pond was built by Fina (now ATOFINA Petrochemicals, Inc.) (ATOFINA) around the time of the purchase. Fina disposed of petroleum waste products generated by normal refinery operations by running a pipe from the refinery to the burn pond. The pond was used to store various refinery byproducts such as slop oil emulsion solids, API separator sludge, and heat exchanger bundle cleaning sludge. A general practice for Fina was to ignite the waste product as it came out of the pipe, with the result that the waste which did not burn, was discharged out of the pipe into the pond.

The site historically contained a burn pond, a stormwater pond, and a smaller settling pond. The dike separating the burn pond and the larger stormwater pond was breached, resulting in a L-shaped pond. Eventually the dike between the stormwater pond and the settling pond also was breached, creating common water between all three ponds.

An open interceptor trench was installed in the late 1950s or early 1960s to intercept seepage from the burn pond to the West Branch Walnut River. The trench was excavated to the top of weathered bedrock and sloped to the east where water was collected and pumped back up to the ponds on site. Although typically effective, the trench occasionally overflowed or was inundated and carried contaminants into the river.

On January 1, 1977, Pester purchased the refinery from Fina and continued refinery operations. Pester filed for bankruptcy on February 25, 1985. Subsequent to Pester's bankruptcy, Coastal Derby Refining Company (later known as Coastal Refining and Marketing, Inc.) purchased the refinery with the exception of the tract of land containing the burn pond. The tract occupied by the burn pond is still owned by Pester. Coastal became El Paso Merchant-Energy-Petroleum Company following the merger of El Paso Corporation and Coastal in January 2001.

Initial Response

In 1980, a preliminary assessment was performed to assess contaminants onsite and to determine if off-site migration of contaminants was occurring. It was determined that further monitoring would be warranted.

On February 28, 1986, the KDHE Administrative Order # 86-E-16 was issued requiring

Pester to conduct a site investigation of this surface impoundment, perform monitoring and submit a Burn Pond Closure Plan. Pester hired Mid West Environmental Consultants (MWEC) to conduct a site investigation which included installation of ten monitoring wells, pond sludge volume determination, soil sampling, sludge sampling, and surface water sampling. The MWEC summarized their findings in 1987.

The Pester Refinery site was placed on the NPL on March 31, 1989, by the EPA pursuant to the authority under CERCLA, as amended by SARA.

Following initial investigations, a Consent Order was signed with Pester, Fina, and KDHE on April 19, 1990, for the responsible parties to conduct the RI to gather field data at the site and to conduct the FS to evaluate alternatives for a cleanup of the site. The RI work was conducted in October 1990 including installation of five additional monitoring wells, verifying the volume of sludge, conducting a tracer test, and collection of sludge, soil, groundwater, and surface water samples. The additional wells were installed in order to determine the chemical and hydraulic properties of the three aquifers beneath the site. The existing and new monitoring wells were sampled for depth and for chemical parameters of volatiles, semi-volatiles, and metals.

The major source of contamination at the site consisted of approximately 20,000 cubic yards of sludge in the burn pond. This material was classified as listed hazardous wastes K049, K050, and K051. The soil beneath the ponds contained most of the constituents found in the sludge, at lower concentrations. The first 12 to 24 inches of soil beneath the ponds are oil-stained as well as up to 5 feet of soil in the bottom of the alluvial aquifer between the eastern boundary of the burn pond and the river. The groundwater beneath the site was found to be impacted by the burn pond. The upper alluvial aquifer was found to contain volatile organics (including benzene, toluene, and xylene) and metals. Benzene, toluene, and xylene were found in the upper bedrock aquifer (Fort Riley Limestone). The lower bedrock aquifer (Florence Limestone) which is separated from the upper aquifer by a confining shale layer, was not impacted by the burn pond sludge above levels of concern.

During late March 1992, a subsurface interceptor trench was constructed on the north and east sides of the burn pond between the pond and the West Branch Walnut River to prevent the seepage of contamination from the burn pond into the river in those areas. This trench extended east and south of the existing open interceptor trench. The subsurface interceptor trench was excavated into weathered bedrock and sloped to a central collection point. Appreciable thicknesses of oil that accumulated at the central collection point were periodically skimmed off of the water in the trench and disposed. Water extracted from the subsurface trench system is returned back to the burn pond or discharged through the water treatment system (oil/water separation and filtration) under a NPDES permit to the West Branch Walnut River.

In December 1993, Fina and KDHE entered into a Consent Order to conduct RI/FS activities for the OU2. The Focused/Abbreviated RI for the OU2 was directed toward augmenting information on the nature and distribution of groundwater and groundwater contamination at the site collected during the original OU1 RI. The PRP, Fina, and their contractor, Sharp and Associates, identified the following goals for the OU2 RI: (1) to gain further understanding of the groundwater flow at the site; (2) to assess interaction between the aquifers; and, (3) to define the extent of groundwater contamination. The field work for completion of the OU2 RI was conducted in June 1994. Three aquifer units were defined for OU2: (1) the alluvial; (2) the upper bedrock, the Fort Riley Limestone; and, (3) the lower bedrock, the Florence Limestone.

Contamination in the alluvial aquifer, which is not considered a drinking water aquifer based on potential yield and inorganic quality, extends from the upgradient edge of the site property to the river to the east and north and to the southern property boundary to the south based on flow direction. The subsurface interceptor trench which was constructed in 1992 serves as a barrier to groundwater contaminant migration to the river. The alluvial aquifer terminates at the river. The highest concentrations of volatile organic compounds (VOCs) were present in the alluvial aquifer. VOCs identified in the alluvial aquifer during the OU2 RI included benzene, ethylbenzene, toluene, and total xylenes. Benzene was present at concentrations in excess of the maximum contaminant level (MCL). Semi-volatile organic compounds (SVOCs) identified in the alluvial aquifer included low concentrations of polycyclic aromatic hydrocarbon compounds (PAHs), phenols, phthalates, naphthalene, and methylnaphthalene. Arsenic, barium, chromium, and lead were present above background concentrations in the alluvial aquifer. Separate-phase hydrocarbons were present in several wells during the OU2 RI sampling.

The upper bedrock aquifer, the Fort Riley Limestone, is locally recharged by the ponds on the site. Groundwater is interpreted as flowing north and east from the ponds and discharging to the West Branch Walnut River. Trace concentrations of benzene, toluene, and total xylenes were detected in a well completed in the upper bedrock aquifer upgradient of the site in 1990. No VOCs were detected in the sample collected from the upgradient well during the OU2 RI. A sample collected in 1990 from a well located downgradient of the burn pond and screened in the upper bedrock aquifer contained higher levels of benzene, toluene, and total xylenes relative to the upgradient well and low levels of arsenic and barium; subsequent samples have not contained elevated concentrations of metals or VOCs. Low concentrations of several SVOCs were detected in the upper bedrock aquifer during the 1994 OU2 RI.

The lower bedrock aquifer, the Florence Limestone, is separated from the upper bedrock aquifer by the Oketo Shale. A background sample collected in the lower bedrock aquifer in 1990 contained trace concentrations of toluene and total xylenes; no VOCs were detected above detection limits at this location during the OU2 RI. Samples collected from a well completed in the lower bedrock aquifer downgradient of the ponds contained no VOCs or SVOCs above detection limits. Arsenic and barium were detected at concentrations below the MCLs for those substances in 1994 and may reflect the naturally-occurring background concentrations for those metals in the aquifer.

Surface water samples were collected from the West Branch Walnut River during the OU2 RI and analyzed for VOCs; no VOCs were present above detection limits.

Basis For Taking Action

The two main exposure pathways for the site were ingestion and direct (dermal) contact with the environmental media (groundwater, surface water, soil, sediment, or sludge). As part of the RI, a risk assessment was completed in order to characterize the current and potential threats to human health and the environment that may be posed by contaminants migrating in sludge, surface soils and sediment, subsurface soils, groundwater, and surface water.

In all, ten compounds were evaluated in the risk assessment as constituents of concern in the pond sludge at the site, xylenes, 2-methylnaphthalene, benzo(a)anthracene, chrysene, phenanthrene, pyrene, arsenic, barium, chromium, and lead, and eleven constituents of concern were identified for the burn pond soils, ethylbenzene, toluene, xylenes, 2-methylnaphthalene, benzo(a)anthracene, chrysene, naphthalene, phenanthrene, phenol, pyrene, and barium.

The risk characterization quantifies present and/or potential future risk to human health that may result from exposure to the contaminants of concern found at the site. The site-specific risk values are estimated by incorporating information from the toxicity and exposure assessments.

The risk assessment quantified the potential carcinogenic and noncarcinogenic risks to human health posed by contaminants of concern in several exposure media. Carcinogenic risk is presented as the incremental probability of an individual contracting some form of cancer over a lifetime as a result of exposure to the carcinogen. A risk of 1×10^{-6} would mean that one person in a million is in potential danger of developing cancer from the site contaminants.

An ecological assessment was conducted as a part of the RI/FS for the purposes of determining possible effects from contamination to the site ecological system.

Based on all factors, EPA made a finding that actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in the OU1 ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

The OU2 risk assessment evaluated data from the alluvial, the upper bedrock, and the lower bedrock aquifers. Unacceptable potential risk could be posed if contamination from the alluvial and upper bedrock aquifers were to impact the lower bedrock aquifer. As a drinking water aquifer, the relevant and appropriate water quality standards for the lower bedrock aquifer

are MCLs. Primary remediation goals for OU2 are therefore to monitor the lower bedrock aquifer to make sure that contaminant levels do not trend upward, so that it does not become contaminated in excess of MCLs for the chemicals of concern in OU2; and to prevent future human exposure to contaminated groundwater within the upper bedrock and alluvial aquifers. Additional remedial goals include preventing separate-phase hydrocarbons from entering the West Branch Walnut River and preventing water with levels of contamination above the applicable water quality standards from discharging into the West Branch Walnut River.

IV. Remedial Actions

Remedy Selection

A ROD was written for OU1 in September 1992. The remedial elements specified in the ROD for OU1 included: excavation of sludge from the three interconnected ponds; dewatering of the sludge; and shipment of the sludge to a permitted Resource Conservation and Recovery Act (RCRA) treatment, storage and disposal (TSD) facility; processing of sludge into petroleum product at an off-site refinery; and, *in-situ* flushing and bioremediation of the contaminated soils in the ponds.

After the ROD was finalized, it was determined that the remedy was not implementable because there were no available refineries at that time which held a permit and were in compliance to accept off-site RCRA hazardous wastes for recycling, making the off-site transportation of sludge materials infeasible. A document (Explanation of Significant Differences, [ESD]) was prepared to explain the changes to the ROD and the reasons these changes were made. The remedy was modified by the ESD to incorporate an alternative method of treating the sludge material. The modified remedy included three-phase separation of the pond sludge on site. The water phase was to be sent to the Coastal Derby wastewater treatment plant which operated under a NPDES permit. The oily phase was to be taken offsite to be recycled. The residual solids were to be further treated onsite to meet Best Demonstrated Available Technology standards to meet the land ban requirement for land disposal. The treated filter cake was then to be disposed at a RCRA-permitted TSD facility in compliance with the off-site policy. The OU1 ROD was supplemented by a second ESD completed in September 1998, which included modifications to the bioremediation system to optimize performance and cost-effectiveness. A third ESD in March 2000 modified the risk assessment to reflect the toxic equivalency factor (TEF) policy for individual carcinogenic toxicities for PAHs.

At the completion of the OU2 RI/FS, a ROD was issued in September 1998 for the OU2 remedy, which included groundwater monitoring and sediment monitoring. Because the risk from the groundwater falls within the acceptable range, no further action is necessary to protect human health and the environment from exposure to the groundwater at the site. The alluvial aquifer is not a usable drinking water source, and the expectation is that contaminant levels at the site will continue to be reduced as a result of the OU1 remediation activities.

Remedy Implementation

In compliance with a Consent Order, the responsible parties designed and implemented the remedial action for OU1 as set forth in the 1992 ROD and amended by the ESDs. The KDHE, Fina, and Pester entered into a Consent Order to complete a Remedial Design/Remedial Action (RD/RA) for OU1 in September 1993. The responsible party contractor removed and processed the sludge on site and the soil was treated by a process of in-situ soil flushing and bioremediation. A treatability study for the soil was completed in the fall of 1994. The pond sludge dredging and removal and recycling of oil contained in the sludge began in December 1995 and continued through March 1996. The design document for the soil portion of OU1 established the organization and technical basis for the in-situ flushing and bioremediation of the pond soils. Following removal of the pond sludge, the ponds were filled with water. Any soil contaminants which were mobilized by the aqueous solution flowed to the interceptor trench for collection, treatment, and reintroduction to the ponds. The subsurface interceptor trench was incorporated into the OU1 remedy to extract seepage from the ponds and maintain hydraulic control, preventing the discharge of separate-phase hydrocarbons and dissolved-phase contaminants into the adjacent river while simultaneously maintaining the water level in the aqueous bioremediation system. Treatment of the trench effluent prior to reintroduction of the effluent to the ponds also served to reduce the mass of contaminants in the ponds and seepage. The treatment process included initially pumping the water from below the oil/water interface in the interceptor trench to preclude the recirculation of separate-phase hydrocarbons, and mechanical filtration to remove suspended contaminants. After this treatment cycle, the water was discharged back into the pond cavities. Aeration of the stained soils/water mixture was provided in the northern half of the stormwater pond via surface aerators. The aeration augmented biodegradation of organic contaminants in the pond water.

Bioremediation and in-situ flushing of the pond soils were conducted in a phased approach. Phase 1 was completed and focused on remediating half of the stormwater pond while simultaneously gathering bioremediation performance data. Phase II focused on addressing the remainder of the stained soil in the ponds. Stained soils from the S1 pond and the southern half of the burn pond were dredged out and stockpiled in the southern half of the stormwater pond and the northern half of the burn pond and fed into the treatment area in the northern half of the stormwater pond to provide a continuous source of hydrocarbon material as food for microbes in the treatment area. Nutrients and other additives determined to optimize the efficiency of the biodegradation of hydrocarbon material were added. The aeration of the ponds, soil additions, and nutrient additions, were suspended during the winter months when the temperature of the pond water precluded effective biodegradation.

The remedial action included monitoring designed to determine if the treatment process was effective. Monitoring has included collection and analysis of samples from the interceptor trench and the treated effluent to determine the effectiveness of the treatment system and the need for additional pretreatment prior to discharge back into the ponds. Soil monitoring

was designed to detect the concentration levels of contaminants of concern in the soils to ensure performance standards of the system are attained. Groundwater monitoring and sediment monitoring were included in the Supplemental Remedial Action Plan in accordance with the OU2 ROD. The groundwater sampling and sediment sampling were conducted quarterly in accordance with the OU2 ROD.

In August 1996, Fina requested that KDHE permit the construction of an extension of the northwestern end of the subsurface interceptor trench at the site to replace the open interceptor trench. The open trench was subject to flooding by the West Branch Walnut River and overflowed on several occasions, releasing wastes into the river. The KDHE approved the interim measure and the trench extension was completed.

Certain aspects of the OU1 remedy have contributed to the mitigation of groundwater contamination and have diminished the potential risk posed by that contamination. Exposure controls implemented as elements of the OU1 remedy include institutional controls in the form of a deed restriction (restrictive covenant) controlling development of the property, a fence to restrict site access, the removal of the material that served as the original source of groundwater contamination (sludge in the ponds), and the operation of the underground interceptor trench.

With the presence of the bioremediation system in the ponds and the recirculation of groundwater through the pond, alluvial aquifer and interceptor trench, it was anticipated that treatment and biodegradation and other natural attenuation processes would continue to reduce the concentration of chemicals of concern in the alluvial groundwater.

The shallow alluvial aquifer is the most significantly impacted water-bearing zone at the site, but is not employed as a drinking water source in the area and does not yield sufficient water to serve as a domestic water supply. Given the maximum saturated thickness of approximately twenty feet for the combined saturated zones of these aquifers that are in communication with each other, the projected maximum sustained yield of the aquifers would be insufficient to serve as a permitted domestic water supply in Kansas. In addition, the total dissolved solids content of water from the thin veneer of saturated alluvium at the upgradient edge of the site exceeds the Secondary Maximum Contaminant Limit for that parameter, suggesting that the water would be non-potable as a result of taste, odor, color, or other non-aesthetic effects. The underlying upper bedrock aquifer, while significantly less impacted, contains elevated concentrations of VOCs, arsenic, and barium. Both the alluvial aquifer and the upper bedrock aquifer normally discharge to the West Branch Walnut River but are currently being captured by the underground interceptor trench. No chemicals of concern for the site have been detected at significant concentrations in the lower bedrock aquifer, a potential drinking water aquifer. The presence of the shale zone within the upper bedrock aquifer isolates the lower bedrock aquifer to some extent from the downward migration of contaminants present in the overlying aquifers.

The original subsurface interceptor trench was constructed during 1992 on the north and east sides of the burn pond between the pond and the West Branch Walnut River to prevent the seepage of contamination from the burn pond into the river in those areas. This trench extended east and south of the open interceptor trench. The subsurface interceptor trench was dug into weathered bedrock and sloped to a central collection point. Water extracted from the subsurface trench system at the collection point is treated by oil-water separation and mechanical filtration and is discharged back to the burn pond. The open interceptor trench was replaced by Fina in August 1996 when the KDHE approved the trench extension of the northwestern end of the subsurface interceptor trench. The process of extracting, treating, and returning the water to the ponds for recirculation reduced the concentrations of contaminants in groundwater through oil-water separation, physical filtration, biodegradation, and other natural attenuation processes.

The operation of the subsurface interceptor trench as a component of the OU1 remedy is effectively preventing any off-site migration of contaminated water, and institutional controls will restrict use of the site to industrial or commercial purposes prohibiting any use of the site for residential purposes. A restrictive covenant recorded and filed in Butler County which runs with the land is binding upon Pester and its successors. The mitigative measures which are components of the OU1 remedy include institutional controls in the form of a deed restriction, a restrictive covenant controlling development of the property and a fence to restrict site access, the treatment and/or removal of the source material (sludge in the pond), and the operation of the underground interceptor trench. The underground interceptor trench was constructed to prevent separate-phase hydrocarbon and dissolved-phase seeps from the ponds from reaching the river and to recirculate trench effluent to the ponds to maintain the aqueous bioremediation system.

On October 16, 1998, the aqueous bioremediation system in the northern half of the stormwater pond including eight 75-Hp surface aerators and one 20-Hp aspirating mixer used to mix the stained soils and provide oxygen for biodegradation, was shut down for the winter months. Prior to the shut-down, the PRP’s contractor, Sharp and Associates, added soils to the bioremediation system which had been dredged from the S1 pond and south burn pond.

On March 29, 1999, the bioremediation system was brought back on-line, and daily sampling of the bioremediation system was initiated on March 30, 1999. The data from the daily samples were evaluated to determine whether the system was operating efficiently. Daily parameters included: heterotrophic plate count, total organic carbon, mixed liquor volatile suspended solids, nitrogen (kjeldahl), phosphorous, chemical oxygen demand, total suspended solids, and on-site respirometry. The mist fence along the northern side of the storm water pond was re-installed to intercept the mist that was generated by the surface aerators. The daily data indicated that the system efficiency began to increase during the month of May 1999. This was seen by the increase in the respirometry rate and mixed liquor volatile suspended solids. A five-day Biological Oxygen Demand analysis was conducted on some of the daily samples.

The groundwater interceptor trench continues to operate. The water from the trench is treated by the water treatment system which consists of oil/water separation and filtration and is discharged. The water treatment system began operation on February 16, 1999, and, during the months following, facilitated the dewatering of the southern half of the burn pond. During the month of July 1999, 580,150 gallons of treated water were discharged to the West Branch of the Walnut River under a NPDES permit.

The verification sampling and closure plan for the S1 pond and southern half of the burn pond was submitted by the PRP's contractor, Sharp and Associates. The S1 pond and southern half of the burn ponds were drained to allow for verification sampling and for the eventual site grading and final closure. Verification sampling was conducted during June 1999; however, based on the fact that the results of the analyses have shown that the concentrations of contaminants found still remain above cleanup goals, further remediation of the ponds stained soils was determined to be required.

System Operation/Operation and Maintenance

The operation and maintenance of the site includes groundwater monitoring and the maintenance of the site, the interceptor trench, and the water treatment system. The responsible parties are responsible for conducting the operation and maintenance activities for the site.

The first five-year review report was completed in September 1999. The site was visited during October 1998, prior to the shut-down of the bioremediation system during the winter months. At the time of re-activation of the bioremediation/soil flushing system during the month of March 1999, a site visit was conducted. The temperature of 52 degrees has been the temperature at which the bioremediation system has been shown to remain active with microbes functioning as intended and providing the required level of treatment.

During June 3-4, 1999, a site visit was conducted by KDHE in order to observe the verification sampling conducted by the PRP's contractor, Sharp and Associates, and to collect split samples for the purpose of quality assurance/quality control oversight. Upon reviewing the analytical data, it was apparent that a good portion of the material sampled for verification testing collected from the south burn pond exceeds the KDHE risk-based standards, and as a result, additional material from the south burn pond was transferred to the stormwater pond for further remediation. Sharp and Associates utilized a trackhoe with a 50-foot arm to transfer material from the south burn pond to the stormwater pond, where this material was subsequently transferred into the bioreactor. The depth of material that needed to be transferred varied over the different regions of the pond. In the locations where impacted materials were identified at subsurface depths ranging from 4 to 10 feet below grade surface, the soil overlaying these impacted materials were stockpiled on site. The stockpiled material was sampled before being used as fill material in the closure of the S1 and south burn pond.

V. Progress Since the Last Five-Year Review

During the last five years, the PRP, ATOFINA, has continued to maintain the site and conduct the quarterly groundwater monitoring and maintenance inspections. A treatability study and a pilot study have been conducted and a phase 2 treatability study is ongoing by ATOFINA in order to investigate modification of the remedy to incorporate the solidification and stabilization of soils. A revised focused FS submitted by ATOFINA has incorporated an alternative for the solidification and stabilization of soils.

Eight quarterly groundwater sampling events have been conducted from October 2000 through July 2002 in accordance with the OU2 ROD and the March 2000 Consent Order Statement of Work. Following this, it was recommended by the PRP that the quarterly groundwater monitoring be continued. The quarterly sampling will continue for at least one year following closure of the site as recommended by KDHE.

In December 2002, ATOFINA submitted the Sediments Report which summarized the quarterly sediment sampling of the West Branch Walnut River required by the OU2 ROD and the Consent Order. The sediment samples were analyzed for VOCs, SVOCs, arsenic, chromium, and lead from October 2000 through November 2002 at upstream, adjacent, and downstream locations. It was concluded by ATOFINA that after eight quarters of sediments sampling, there was no significant trend in metal or VOC concentrations across the site because the concentrations detected in upstream, adjacent, and downstream sediment samples over the quarterly sampling events showed fluctuations in the most contaminated to the least contaminated. ATOFINA determined that the site does not significantly impact the river and recommended that the sediments sampling be discontinued in 2003. Any additional sediment and/or surface water sampling will be addressed in a ROD Amendment.

Five additional piezometers (P9 to P13) were installed around the stormwater and the north burn ponds during the week of March 24, 2003, to further define the alluvial groundwater surface in this area. The water levels were collected in these piezometers for the first time on April 1, 2003, during the second quarter 2003 sampling event. The data obtained from these additional piezometers confirmed previous interpretations. Groundwater is flowing northeast and east toward the West Branch Walnut River. In the vicinity of the river, the Florence Aquifer has a potentiometric head that is approximately 15 feet higher than either the Alluvial Aquifer or the Fort Riley Aquifer. During the third quarter 2003, in the vicinity of P9, W30D, and W07S (west of the site), an upward vertical gradient existed from the bedrock aquifers (Fort Riley Aquifer and Florence Aquifer) to the Alluvial Aquifer. The upward gradient from the Florence Aquifer in the vicinity of W30D was about two feet.

Monitoring well W39 was installed during the week of March 24, 2003, and sampled for the first time during the second quarter 2003. This well was installed on the west side of the storm pond in order to define groundwater quality upgradient of the site. Upgradient well W30 had been damaged and therefore the alluvial groundwater quality upgradient of the site was not sufficiently defined.

During the third quarter 2003, twelve monitoring wells were sampled and analyzed for volatiles, semi-volatiles and metals. This includes seven Alluvial Aquifer wells (W05, 24, 33, 35, 36, 37, and 39), three Fort Riley Aquifer wells (W07S, 31S, and 36S), and two Florence

Aquifer wells (W05D and 30D).

From September 29 through October 2, 2003, the fourth quarter 2003 sampling included sampling the twelve monitoring wells and piezometer, P-12, for volatiles, semi-volatiles, and metals. The piezometer was sampled to verify that data from W-05 were representative of the aquifer quality east of the ponds. The piezometer P-12 was installed 150 feet south of W-05, also directly downgradient of the north burn pond. The results indicated similar levels of VOCs between W-05 and P-12, but the levels of PAHs detected in P-12 were greater.

The first quarter 2004 sampling event was conducted during February 2 through 6, 2004. Eleven monitoring wells and a piezometer were sampled and analyzed for volatiles, semi-volatiles, and metals. The eleven wells included seven Alluvial Aquifer wells and one piezometer, W-05, W-24, W-33, W-35, W-36, W-37, W-39, and P-12, three Fort Riley Aquifer wells, W-07S, W-31S, and W-36S, and one Florence Aquifer well, W-30D.

During the weeks of April 5, 2004, and April 12, 2004, five additional monitoring wells were installed: W-39S, W-40, W-40S, W-40D, and W-41; and W-05 was replaced with W-05R. These new wells were included in the sampling for second quarter 2004. The second quarter 2004 sampling was conducted during the week of April 19, 2004. The construction logs for the new wells are included in the second quarter 2004 monitoring report.

Sampling of the wells has been done using the EPA low-flow (minimum draw down) groundwater sampling procedure in all of the wells. The water quality parameters: pH, dissolved oxygen, conductivity, temperature, turbidity, and oxidation-reduction potential (beginning in April 2004) were measured in all the wells.

The groundwater constituents of concern as identified in the OU2 ROD include VOCs, benzene, toluene, ethylbenzene, carbon disulfide and xylene, SVOCs, 2,4-dimethylphenol, 2-methylnaphthalene, acenaphthene, dibenzofuran, fluorene, naphthalene, phenanthrene, phenol, dimethylphthalate, and metals, arsenic, chromium, barium, and lead.

The second quarter 2004 groundwater monitoring data collected from April 19 through April 22, 2004, included sixteen monitoring wells and one piezometer. These include eight Alluvial Aquifer wells and one piezometer, five Fort Riley wells, and three Florence Aquifer wells.

Alluvial Aquifer

Concentrations of benzene have remained constant or declining in wells except for upgradient well W-24 and downgradient well W-05 (and W-05R). Since

October 2000, benzene concentrations ranged from 8.3 ug/l to 130 ug/l in W-05 and 82 ug/l to 290 ug/l in W-24.

Arsenic concentrations have shown fluctuations with P-12 showing the highest concentration in second quarter 2004 at 0.09 mg/l and W-39 at 0.071 mg/l.

Total lead during second quarter 2004 was non-detect in all alluvial wells except W-39 at 0.13 mg/l and W-33 at 0.054 mg/l.

Fluorene was detected in W-05R at 3.5 ug/l, in W-40 at 1.1 ug/l, and in W-35 at 0.61 ug/l in second quarter 2004.

Phenanthrene was detected in W-05R at 6.1 ug/l and in W-40 at 1.9 ug/l in second quarter 2004.

Fort Riley Limestone Aquifer

Benzene was detected in upgradient wells W-39S at 2.8 ug/l, in W-40S at 0.67 ug/l, and in downgradient well W-31S at 0.23 ug/l during second quarter 2004.

Fluorene and acenaphthene were detected in W-31S during first quarter 2004 at 1.9 ug/l and 2 ug/l. During second quarter 2004, Fluorene, acenaphthene, and dibenzofuran were detected in W-31S. 2-Methylnaphthalene, naphthalene, phenanthrene, and phenol were detected in W-40S.

Lead was non-detect for all wells in the Fort Riley during first and second quarters 2004.

Arsenic concentration in well W-07S was detectable at 0.0041 mg/l and in well W-31S at 0.0036 mg/l, below the MCL (.05 mg/l) during first quarter 2004 and arsenic was detected in W-39S at 0.031 mg/l, in W-40S at 0.023 mg/l, and in W-07S at 0.0035 mg/l in second quarter 2004.

Florence Limestone Aquifer

Water quality standards for the Florence Limestone are the MCLs of the Drinking Water Standards as stated in the 1998 OU2 ROD, as follows: arsenic 0.05 mg/l (using for comparison and evaluation purposes 0.01 mg/l 2001 adopted standard), barium 2.0 mg/l, total chromium 0.10 mg/l, lead 0.015 mg/l, benzene 0.005 mg/l, toluene 1.0 mg/l, ethylbenzene 0.70 mg/l, and xylene 10.0 mg/l.

Benzene was detected in W-30D at 0.42 ug/l and W-40D at 0.25 ug/l during second quarter 2004.

During first quarter 2004, xylenes were detected in well W-30D at 0.74 ug/l.

No SVOCs were detected during first or second quarter 2004.

Total arsenic increased in upgradient well W-30D from 0.016 mg/l to 0.035 mg/l in first quarter 2004 and was detected at 0.017 mg/l in upgradient well W-30D and below the MCL in W-05D and W-40D in second quarter 2004.

Total lead has remained non-detect since March 2001.

The phase 2 solidification treatability study is ongoing. In June 2004, ATOFINA collected the samples required by the phase 2 solidification treatability study work plan, and admixtures were made to begin some of the curing process for the treatability study investigation.

VI. Five-Year Review Process

Administrative Components/Community Involvement

The Pester Refinery site five-year review has included the following team members: Catherine Barrett, EPA Remedial Project Manager; E. Jean Underwood, KDHE Project Manager; John Wehunt, Project Manager with the PRP, ATOFINA; Annie Lefebvre, Project Engineer with the PRP contractor, Sharp and Associates; and the EPA Community Involvement Coordinator.

This five-year review consisted of the following activities: (1) a review of relevant documents (Attachment 1); (2) discussions among representatives of the EPA, the KDHE, the PRP, ATOFINA, and the PRP contractor, Sharp and Associates; and, (3) a site inspection on July 20, 2004, attended by Catherine Barrett, EPA, E. Jean Underwood, KDHE, John Wehunt, ATOFINA, Annie Lefebvre, Sharp and Associates, and Rod Wohlgemuth, Site Operator.

A notice regarding the initiation of the five-year review was placed in a local newspaper and at the end of the review, a newspaper notice will be placed indicating the availability of the five-year review report for the public. The completed five-year review report will be available in the site information repository, the Bradford Memorial Library, 611 South Washington, El Dorado, Kansas 67042; in the EPA Superfund Division Records Center, 901 North 5th Street, Kansas City, Kansas 66101; and in the KDHE offices, Curtis State Office Building, 1000 S.W. Jackson Street, Topeka, Kansas 66612.

Document Review

Section 121 (d) of CERCLA, as amended by SARA, requires that remedial actions comply with applicable, or relevant and appropriate requirements or standards (ARARs) under federal or state environmental statutes or regulations. Several action-specific ARARs and chemical-specific ARARs have been considered in the RODs for OU1 and OU2 for this site.

The sludge onsite was a listed hazardous waste because of having been generated as slop oil emulsion solids, API separator sludges, and heat exchanger bundle cleaning sludges, K049, K050, and K051 respectively; and the pond has historically been treated as a RCRA regulated hazardous waste impoundment.

The action-specific ARARs are closure and post-closure requirements defined in (1) RCRA of 1976, as amended by the Hazardous and Solid Waste Amendments of 1984, 42 U.S.C. Section 6901 et. seq., and in (2) the Solid Waste Regulations, 40 CFR 240-281, and (3) the Kansas Solid Waste Management Act, and (4) the Kansas Hazardous Waste Management Act.

The chemical-specific ARARs are (1) Federal MCLs for inorganics and organics in drinking water supplies, 40 CFR Part 141, as defined in the Safe Drinking Water Act (SDWA) of 1974, as amended in 1986, 42 U.S.C., Section 300 et. seq., (2) the Federal Ambient Water Quality Standards as defined by the Clean Water Act (CWA) of 1977, as amended by the Water Quality Act (WQA) of 1987, 33 U.S.C., Section 1251 et. seq., and (3) state of Kansas water quality standards.

Data Review

Quarterly groundwater monitoring was included as a requirement as part of the OU2 ROD. The groundwater monitoring continues to be implemented by the PRP, ATOFINA. The surface water Sediments Report was submitted by ATOFINA on December 26, 2002, and this report included a recommendation by the PRP contractor that the surface water sediment monitoring be discontinued. Any additional sediment or surface water sampling monitoring will be addressed in the ROD Amendment.

The spring located on the banks of the river in the vicinity of manhole MH-02 has been sampled, and no compound was detected in the spring water. Static groundwater levels were measured prior to the sampling of all monitoring wells and piezometers. Free product was not observed at any well or piezometer during the collection of water level measurements.

The groundwater flow patterns of the three aquifers have remained consistent with historical data. Groundwater is flowing toward the east. Groundwater in the Alluvial Aquifer is flowing toward the interceptor trench and the West Branch Walnut River. Water levels have increased in all aquifers since last quarter. The lowest water levels occur in late fall and early winter, and the highest levels occur in spring and early summer. During the second quarter 2004,

in the vicinity of W-30D and W-07S, there was a downward vertical gradient between the Fort Riley Aquifer and the Florence Limestone Aquifer. The new W-40 well cluster on the west side of the closed S1 pond shows an upward gradient from the Florence Aquifer to the Fort Riley Aquifer and to the Alluvial Aquifer. In the vicinity of the river as has been historically observed, there was an upward gradient from the Florence Aquifer to the Fort Riley Aquifer and upward from the Fort Riley Aquifer to the Alluvial Aquifer and eroded top of the Fort Riley Aquifer.

The water levels, field parameters and trends in groundwater concentrations for monitoring wells in each of the three aquifers are shown in tables and figures in Attachment 2 of this report.

Site Inspection

On July 20, 2004, a site inspection was conducted by Catherine Barrett, Remedial Project Manager, EPA; E. Jean Underwood, Project Manager, KDHE; John Wehunt, Project Manager, for the PRP, ATOFINA; Annie Lefebvre with the PRP contractor, Sharp and Associates; and, Rod Wohlgemuth, Site Operator. The purpose of the inspection was to assess the protectiveness of the remedy, including the maintenance of the site, the monitoring wells, the water treatment system, the fence surrounding the site, and the institutional controls.

The site inspection included a review of the area security, a site walk-around to assess the remedial action, the observation of pile soils locations, the capped area where soils had been graded and seeded, and observation of the monitoring wells, including a review of the locations of the new wells installed in April 2004. The inspection team entered the site via the road along the western edge of the refinery (no longer in operation) and met at the site trailer to begin the access to the site and the site inspection. The walk-around was led by John Wehunt, ATOFINA, and, after reviewing the site safety protocol to ensure compliance with procedures, began by going south along the west edge of the stormwater pond. The treatment plant had been moved to the concrete pad on the west side of the stormwater pond. Previously the treatment plant was located northeast of the north burn pond and west of the West Branch Walnut River. Monitoring wells and piezometers were inspected along the access road which surrounds the stormwater pond and the north burn pond. A new piezometer, number 13 (P-13) located south of the storm pond, was installed in April 2004. The inspection team proceeded along the southern edge of the storm pond and the north burn pond. Pile soils from the capped area were located along the northern edge of the access road. The area to the south of the access road which had been closed, graded, and seeded in 1999 was covered with a thick vegetative cover and had recently been mowed. The south burn pond which had previously been located in this recently capped area had previously been surrounded by an area of steep relief to the subsurface interceptor trench and the West Branch Walnut River. The area now gently sloped to the area of the subsurface interceptor trench where manholes were visible. This gently sloping area is an improvement to the site and less threatening during periods of storms, high water, overflowing of the ponds, or flooding of the river. A new monitoring well, W-05R on the east side of the north burn pond was constructed in April 2004 to replace W-05, which had been accumulating product and inhibiting the groundwater sampling.

The inspection of the site indicated that the site has been well maintained. The capped area over the former south burn pond has been seeded with a vegetative cover. The appearance of the site is improved by the capping and the threat of the overflowing of the ponds and flooding of the river onto site property has been diminished. The fence surrounding the capped area and the ponds was intact and serves to deter any entrance or damage to the site cover or monitoring wells.

There has been no change in land use surrounding the site since the last five-year review. Residential development is not any nearer to the site. The refinery which is no longer operating occupies property to the west of the site and the access road along the western edge of the refinery providing access to the site is surrounded by a fence and “no trespassing” signs. The West Branch Walnut River flows along the north and east sides of the site, and agricultural land lies across the river to the east. The El Paso facility occupies the property to the south, and public access is not allowed onto this property.

No significant issues have been identified during the site inspection or during the five-year review regarding the site conditions. Site photographs are shown in Attachment 3.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

- Implementation of Institutional Controls and Other Measures - The PRP, ATOFINA, continues to be responsible for the site, and there are no current or planned changes in land use at the site. A restrictive covenant was recorded and filed in Butler County on February 25, 1994, requiring that the site be used for industrial or commercial purposes and not be used or occupied for residential purposes.

- Remedial Action Performance - The review of documents, ARARs, risk assumptions, and the results of the site inspection indicate that the remedy of removal of the source of site contamination, the pond sludge, offsite and bioremediation and soil-flushing which was selected in the OU1 ROD has achieved some success in cleaning up the site. Reduction in contaminants achieved by the remedy has continued over time, but has stabilized recently. The PRP has investigated incorporating the remedy of solidification/stabilization at the site. A treatability study (phase 1) and a pilot study have been completed by the PRP contractor and phase 2 of the treatability study is ongoing to investigate admixtures for the solidification/stabilization remedy.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

- Changes in Standards and "To Be Considered" Requirements - The Arsenic MCL was lowered to 0.01 mg/l in 2001.

- Changes in Exposure Pathways - No changes in the site conditions that affect exposure pathways were identified as part of this five-year review. There are no current or planned changes in land use. No new contaminants, sources, or routes of exposure were identified as part of this five-year review. There is no indication that hydrologic or geologic conditions are not adequately characterized.

- Changes in Toxicity and Other Contaminant Characteristics - The EPA policy for toxic equivalency factors for carcinogenic PAHs was incorporated as part of the risk analysis in a March 2000 ESD.

- Changes in Risk Assessment Methodologies - There are no changes in risk assessment methodologies since the time of the ROD approval which call into question the protectiveness of the remedy. An ESD was completed in March 2000 which reflected the current policy of toxic equivalency factors with regard to carcinogenic PAHs.

- Remedial Action Objectives used at the time of the remedy selection are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

- There has been a reduction in contaminants at the site. The removal of the source of contamination which was part of the OU1 remedy has been completed. The bioremediation and soil flushing have reduced contaminants at a slower rate in recent years and may not be a remedy which will meet cleanup levels in the near future. The quarterly groundwater monitoring continues as part of the OU2 remedy. The PRP has initiated an investigation of solidification/ stabilization of soils on site.

Technical Assessment Summary

The physical conditions at the site have changed as the consolidation of soils has been implemented and portions of the ponds have been remediated. The phase 1 treatability study and the pilot study completed by the PRP and the ongoing phase 2 treatability study have investigated methods for the incorporation of the solidification/stabilization of soils on site. A focused feasibility study submitted by the PRP and still under review by KDHE and EPA includes explanation of the proposed remedial alternative for the solidification/stabilization of soils on site.

VIII. Issues

There were no deficiencies discovered during this five-year review. The incorporation of the solidification/stabilization of soils is included in the focused FS submitted by the PRP and their contractor. The phase 1 treatability study and pilot study were completed by ATOFINA and their contractor; the phase 2 treatability study is ongoing to investigate admixtures for a solidification remedy.

IX. Recommendations and Follow-up Actions

No deficiencies were discovered during this five-year review. A ROD Amendment is in preparation in order to meet remedial action objectives, and it is recommended that continued groundwater monitoring be conducted by the PRP, ATOFINA.

X. Protectiveness Statement

The results of the five-year review indicate that the remedy has been shown to be effective with the removal of the source of contamination, the sludge in the burn pond, from the site. The OU1 remedy of bioremediation and soil flushing has successfully reduced some contamination at the site, but the rate of reduction of contaminants has declined in recent years and the remedy may not be able to meet cleanup levels in the near future. The PRP, ATOFINA, completed a phase 1 treatability study and pilot study and initiated a phase 2 treatability study to investigate the stabilization/solidification of the remaining contaminated soils onsite. Groundwater monitoring continues as part of the OU2 remedy. The site is surrounded by a fence. Institutional controls have taken the form of a restrictive covenant restricting the use of the property to industrial or commercial purposes prohibiting any use of the site for residential purposes. The site will have met the remedial action objectives and be fully protective of human health and the environment when the proposed solidification remedy is complete.

XI. Next Review

This is a statutory five-year review. The first five-year review was conducted in 1999. The next five-year review for this Superfund site will be conducted in the year 2009.

ATTACHMENTS

ATTACHMENT 1

Documents Reviewed

"Remedial Investigation Report, Pester Burn Pond Site, El Dorado, Kansas", prepared for Fina Oil and Chemical Company, prepared by Metcalf and Eddy, May, 1991.

"Record of Decision, Pester Burn Pond First Operable Unit, El Dorado, Kansas", by EPA, September 29, 1992.

"Explanation of Significant Differences, Pester Burn Pond First Operable Unit, El Dorado, Kansas", by EPA, September 15, 1993.

"Focused Feasibility Study for the Groundwater Operable Unit at the Pester Burn Pond Site in El Dorado, Kansas", prepared for Fina Oil and Chemical Company, prepared by Sharp and Associates, Inc., June 1996.

"Explanation of Significant Difference, Pester Refinery Company/Pester Burn Pond Site, Soil and Sludge Operable Unit, El Dorado, Kansas", by EPA, August 21, 1998.

"Record of Decision, Pester Refinery Company/Pester Burn Pond Site, Groundwater Operable Unit, El Dorado, Kansas", by EPA, September 29, 1998.

"Superfund Preliminary Close-Out Report, Long-Term Remedial Action, Pester Refinery Company Superfund Site, El Dorado, Kansas", by EPA, September 8, 1999.

"Five-Year Review Report for the Pester Refinery Site, El Dorado, Kansas", by EPA, September 16, 1999.

"Explanation of Significant Difference, Pester Refinery Company/Pester Burn Pond Site, Soil and Sludge Operable Unit, El Dorado, Kansas", by EPA, March 1, 2000.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, Fourth Quarter 2000", by Sharp and Associates.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, First Quarter 2001", by Sharp and Associates.

"Report on Bioremediation Activities and Results for the Year 2000", by Sharp and Associates, March 2001.

"Draft Focused Feasibility Study for the Soil and Sludge Operable Unit (OU1), Pester Burn Pond Superfund Site, El Dorado, Kansas", by ATOFINA and Sharp and Associates, March 2001.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, Second Quarter 2001", by Sharp and Associates.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, Third Quarter, 2001", by Sharp and Associates.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, Fourth Quarter 2001", by Sharp and Associates.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, First Quarter 2002", by Sharp and Associates.

"Work Plan for Implementing Pilot Demonstration, North Burn Pond and Stormwater Pond, Soil Stabilization/Solidification, Pester Burn Pond Superfund Site, El Dorado, Kansas", by Sharp and Associates, February 2002.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, Second Quarter 2002", by Sharp and Associates.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, Third Quarter 2002", by Sharp and Associates.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, Fourth Quarter 2002", by Sharp and Associates.

"Sediments Report, Pester Burn Pond, El Dorado, Kansas, Fourth Quarter 2002, by Sharp and Associates.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, First Quarter 2003", by Sharp and Associates.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, Second Quarter 2003", by Sharp and Associates.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, Third Quarter 2003", by Sharp and Associates.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, Fourth Quarter 2003", by Sharp and Associates.

"Draft Focused Feasibility Study for the Soil and Sludge Operable Unit (OU1) at the Pester Burn Pond Site in El Dorado, Kansas", by ATOFINA and Sharp and Associates, April 2003.

"Proposed Surface Water Quality Standards for the Pester Burn Pond Superfund Site in El Dorado, Kansas", by Sharp and Associates, June 13, 2003.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, First Quarter 2004", by Sharp and Associates.

"Quarterly Monitoring Report on the Pester Burn Pond, El Dorado, Kansas, Second Quarter 2004", by Sharp and Associates.

ATTACHMENT 2

Site Tables and Figures

Data for 2004

Table 1. Water Levels Recorded April 20, 2004 at the Pester Burn Pond Site

Well	Aquifer	Measuring Point Elevation (ft)	Depth to Water (ft)	Date	Potentiometric Surface Elevation (ft) (AMSL)
P-01	Alluvial	1289.09	11.98	4/20/04	1277.11
P-02	Alluvial	1288.94	10.83	4/20/04	1278.11
P-03	Alluvial	1305.09	6.8	4/20/04	1298.29
P-06	Alluvial	1295.31	10.56	4/20/04	1284.75
P-07	Alluvial	1292.62	13.04	4/20/04	1279.58
P-08	Alluvial	1297.11	17.78	4/20/04	1279.33
P-09	Alluvial	1304.83	4.12	4/20/04	1300.71
P-10	Alluvial	1303.63	12.34	4/20/04	1291.29
P-11	Alluvial	1303.2	13.02	4/20/04	1290.18
P-12	Alluvial	1303.33	23.22	4/20/04	1280.11
P-13	Alluvial	1302.54	5.42	4/20/04	1297.12
River	Alluvial	1280.00	3.37	4/20/04	1276.63
W-01D	Florence	1291.68	1.14	4/20/04	1290.54
W-01S	Fort Riley	1289.17	12.67	4/20/04	1276.50
W-03	Alluvial	1304.68	13.09	4/20/04	1291.59
W-05	Alluvial	1303.96	*	4/20/04	*
W-05D	Florence	1294.02	0.83	4/20/04	1293.19
W-05R	Alluvial	1303.76	24.58	4/20/04	1279.18
W-07S	Fort Riley	1309.30	2.17	4/20/04	1307.13
W-22	Alluvial	1292.95	17.24	4/20/04	1275.71
W-23	Alluvial	1303.82	7	4/20/04	1296.82
W-24	Alluvial	1305.36	7.47	4/20/04	1297.89
W-30D	Florence	1308.54	5.17	4/20/04	1303.37
W-31	Alluvial	1287.58	11.06	4/20/04	1276.52
W-31S	Fort Riley	1288.23	11.72	4/20/04	1276.51
W-33	Alluvial	1293.19	15.86	4/20/04	1277.33
W-35	Alluvial	1288.03	11.48	4/20/04	1276.55
W-36	Alluvial	1286.87	10.26	4/20/04	1276.61
W-36S	Fort Riley	1287.20	2.19	4/20/04	1285.01
W-37	Alluvial	1293.07	12.64	4/20/04	1280.43
W-38	Alluvial	1305.19	3.37	4/21/04	1301.82
W-39	Alluvial	1303.11	0.07	4/20/04	1303.04
W-39S	Fort Riley	1303.66	1.22	4/20/04	1302.44
W-40	Alluvial	1305.97	6.18	4/20/04	1299.79
W-40D	Florence	1305.98	0.06	4/20/04	1305.92
W-40S	Fort Riley	1305.91	6.47	4/20/04	1299.44
W-41	Alluvial	1292.86	15.92	4/20/04	1276.94

Low-flow sampling technique was unable to be used to sample well.

* Well W-05R is replacing W-05

Table 2. Field Parameters, Second Quarter 2004

WELL	DATE	COND (uS/cm)	DO (mg/L)	pH (s.u.)	TEMP (°C)	Turbidity (NTU)	ORP (mV)
P-12	4/22/04	4350	2.62	9.43	14.8	71.1	-228
W-05D	4/21/04	5070	1.3	6.94	14.8	22	-50
W-05R	4/20/04	3740	0.15	7.25	17.1	19.9	-184
W-07S	4/21/04	1400	0.86	6.85	14.5	16.8	-63
W-24	4/21/04	1380	0.64	6.78	14.3	17.2	-129
W-30D	4/21/04	1560	4.23	6.82	14.3	10.9	-104
W-31S	4/22/04	5560	6.8	7.09	13.6	1.53	-219
W-33*	4/21/04	4620	1.1	8.13	16.4	662	-190
W-35	4/21/04	2610	4.27	6.75	12.8	3.8	-113
W-36	4/21/04	2230	4.61	6.81	13.7	7.82	-99
W-36S	4/20/04	2820	2.71	7.48	14.8	10.2	-76
W-37	4/22/04	1430	1.75	7.34	12	8.88	-166
W-39	4/22/04	2990	2.42	6.44	14.7	18.4	-97
W-39S	4/20/04	3330	1.95	6.32	15.4	24.5	-33
W-40	4/20/04	1310	0.06	6.95	14.3	21.2	-130
W-40D	4/19/04	1290	0.11	7.11	18	11.1	-58
W-40S	4/19/04	1410	0.41	6.98	17.7	23.8	-107

ORP and DO values may be anomalous; meter is suspected to be malfunctioning.
* = Low flow sampling could not be done due to slow recharge, sample obtained with a bailer.

Table 3. Detected Volatile Results, Second Quarter 2004

CHEM KEY	Interceptor Trench (4/22/04)	P-12 (4/22/04)	W-05R (4/20/04)	W-05D (4/21/04)	W-07S (4/21/04)	W-24 (4/21/04)	W-30D (4/21/04)	W-31S (4/22/04)	W-33 (4/22/04)	W-35 (4/21/04)	W-36 (4/21/04)	W-36S (4/20/04)	W-37 (4/22/04)	W-39 (4/22/04)	W-39S (4/20/04)	W-40 (4/20/04)	W-40D (4/19/04)	W-40S (4/19/04)	Spring (4/22/04)
1,2,4-Trimethylbenzene	25	9.7	22	<1	<1	1.2 J	0.23 J	3.2	7.5	0.34 J	<1	<1	220	<5	<8	<1.7	<1	<1.7	<1
1,3,5-Trimethylbenzene	7.3	1.7 J	6.9	<1	<1	<8	<1	<1	1.7	<1	<1	<1	49	<5	<8	<1.7	<1	<1.7	<1
2-Chlorotoluene	0.29 J	<3.3	<5	<1	<1	<8	<1	<1	<1.7	<1	<1	<1	<8	<5	<8	<1.7	<1	<1.7	<1
Benzene	15	57	130	<1	<1	200	0.42 J	0.23 J	27	1.4	<1	<1	34	<5	2.8 J	1.8	0.25 J	0.67 J	<1
Carbon disulfide	11	76	<5	<1	<1	<8	<1	<1	24	<1	<1	<1	<8	<5	<8	<1.7	0.33 J	<1.7	<1
Chloroethane	<1	<3.3	<5	<1	<1	<8	<1	<1	<1.7	<1	<1	<1	<8	<5	<8	2.2	<1	<1.7	<1
Chloroform	<1	<3.3	<5	<1	<1	<8	<1	<1	<1.7	<1	<1	<1	<8	<5	2.3 J	<1.7	<1	<1.7	<1
Ethylbenzene	4.3	3.3	22	<1	<1	10	0.22 J	0.28 J	3.4	0.28 J	<1	<1	150	<5	<8	<1.7	<1	<1.7	<1
Isopropylbenzene	4.3	1 J	8.4	<1	<1	19	<1	0.27 J	2.1	1.1	<1	<1	19	<5	<8	4.2	0.2 J	1.5 J	<1
Methylene Chloride	0.91 J	<3.3	<5	<1	<1	<8	<1	<1	<1.7	<1	<1	<1	22	<5	<8	<1.7	<1	<1.7	<1
n-Butylbenzene	<1	<3.3	3.5 J	<1	<1	6.4 J	<1	0.18 J	1 J	0.33 J	<1	<1	<8	<5	<8	1.2 J	<1	0.49 J	<1
n-Hexane	3.4	<3.3	6.2	<1	<1	6.7 J	<1	<1	1.4 J	<1	<1	<1	110	<5	<8	<1.7	<1	<1.7	<1
n-Propylbenzene	5.6	1.2 J	14	<1	<1	23	<1	<1	2.7	0.92 J	<1	<1	21	<5	<8	3.6	<1	1.1 J	<1
o-Xylene	19	12	16	<0.5	<0.5	2.2 J	1.3	2.3	4.8	1.4	0.72	<0.5	180	<2.5	<4	0.77 J	<0.5	<0.84	<0.5
p-Isopropyltoluene	1.3	<3.3	1.6 J	<1	<1	3.4 J	<1	<1	1.7	<1	<1	<1	8.4	<5	<8	<1.7	<1	<1.7	<1
sec-Butylbenzene	1.1	<3.3	2.2 J	<1	<1	3.3 J	<1	0.31 J	1.1 J	0.4 J	<1	<1	<8	<5	<8	<1.7	<1	0.68 J	<1
Toluene	23	41	27	<1	<1	8.2	2.6	<1	16	2.5	<1	<1	170	<5	2.3 J	2.2	2	2	<1
Xylenes, Total	57	32	68	<1	<1	19	2.4	4.6	18	3.6	1.6	<1	690	<5	<8	3.3	<1	<1.7	<1

Notes
- J = Estimated concentration detected between the method detection limit and the laboratory reporting limit.
- Full VOC scan run by method 8260.
- Results in µg/l.

Table 4. Detected Semi-Volatile Results, Second Quarter 2004

PARAMETER (µg/l)	Interceptor Trench (4/22/04)	P-12 (4/22/04)	W-05D (4-21-04)	W-05R (4/20/04)	W-07S (4/21/04)	W-24 (4/21/04)	W-30D (4/21/04)	W-31S (4/22/04)	W-33 (4/22/04)	W-35 (4/21/04)	W-36 (4/21/04)	W-36S (4-20-04)	W-37 (4/22/04)	W-39 (4/22/04)	W-39S (4/20/04)	W-40 (4/20/04)	W-40D (4/19/04)	W-40S (4/19/04)	Spring (4/22/04)
2,4-Dimethylphenol	180 J	2800 J	<10	<40	<10	<40	<10	<10	1500 J	<10	<10 J	<10	<67	<25	<40	<10	<10	<10	<10
2-Methylnaphthalene	<200	<4000	<10	73	<10	76	<10	<10	<2000	<10	<10	<10	86	<25	<40	1.9 J	<10	4.1 J	<10
2-Methylphenol	550	13000	<10	<40	<10	<40	<10	<10	4400	<10	<10 J	<10	<67	<25	<40	<10	<10	<10	<10
4-Methylphenol	660	240 J	<10	<40	<10	<40	<10	<10	4600 J	<10	<10 J	<10	<67	<25	<40	<10	<10	<10	<10
Acenaphthene	<200	<4000	<10	3.5 J	<10	1.8 J	<10	1.9 J	<2000	1.5 J	<10	<10	<67	<25	<40	3.4 J	<10	<10	<10
Anthracene	<200	<4000	<10	<40	<10	<40	<10	<10	<2000	<10	<10	<10	<67	<25	<40	1.1 J	<10	<10	<10
bis(2-Ethylhexyl) phthalate	<200	<4000	<10	<40	<10	1.7 J	<10	<10	<2000	<10	3.4 J	<10	<67	<25	<40	<10 J	<10	<10	<10
Carbazole	<200	<4000	<10	4.7 J	<10	<40	<10	0.63 J	<2000	<10	<10	<10	<67	<25	<40	1.6 J	<10	<10	<10
Dibenzofuran	<200	<4000	<10	<40	<10	<40	<10	0.77 J	<2000	<10	<10	<10	<67	<25	<40	1 J	<10	<10	<10
Dimethyl phthalate	<200	<4000	<10	<40	<10	<40	<10	<10	<2000	<10	<10	<10	<67	<25	<40	<10	<10	<10	<10
Fluoranthene	<200	<4000	<10	<40	<10	<40	<10	<10	<2000	<10	<10	<10	<67	<25	<40	0.47 J	<10	<10	<10
Fluorene	<200	<4000	<10	3.5 J	<10	<40	<10	1.5 J	<2000	0.61 J	<10	<10	<67	<25	<40	1.1 J	<10	<10	<10
Naphthalene	<200	<4000	<10	50	<10	120	<10	<10	<2000	<10	<10	<10	170	<25	<40	9.4 J	<10	2.4 J	<10
Phenanthrene	<200	<4000	<10	6.1 J	<10	<40	<10	<10	<2000	<10	<10	<10	<67	<25	<40	1.9 J	<10	0.95 J	<10
Phenol	350	<4000	<10	3.4 J	2.3 J	5.8 J	<10	<10	<2000	0.44 J	<10 J	<10	<67	<25	<40	<10	<10	3.7 J	<10
Pyrene	<200	<4000	<10	<40	<10	<40	<10	<10	<2000	<10	<10	<10	<67	<25	<40	0.65 J	<10	<10	<10

Notes
- J = Estimated concentration detected between the method detection limit and the laboratory reporting limit.
- Full SVOC scan run by method 8270.
Results in µg/l.

Table 5. Detected Metals Results, Second Quarter 2004

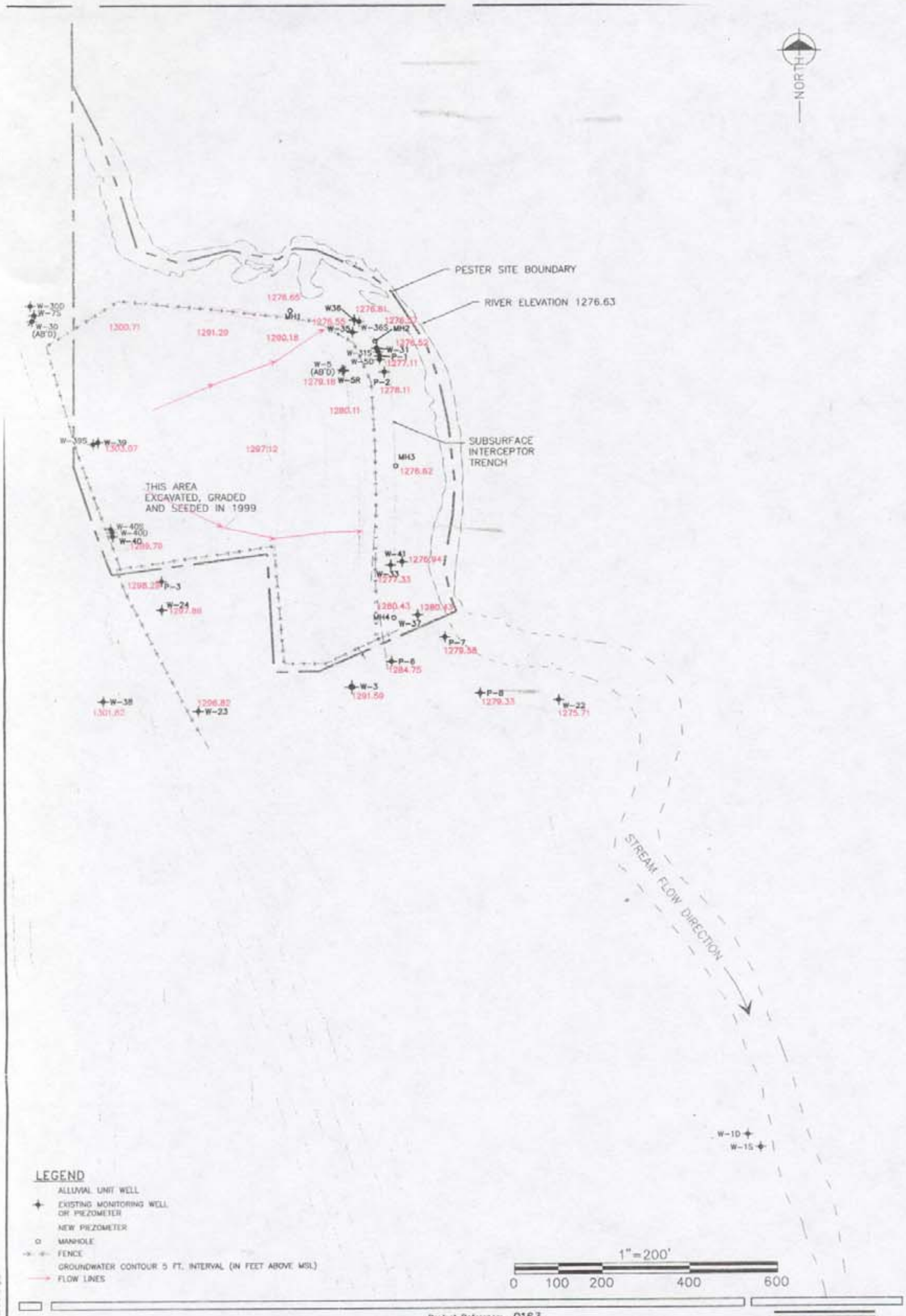
Parameter	Interceptor Trench (4/22/04)	P-12 (4/22/04)	W-05D (4/21/04)	W-05R (4/20/04)	W-07S (4/21/04)	W-24 (4/21/04)	W-30D (4/21/04)	W-31S (4/22/04)	W-33 (4/22/04)
Aluminum	<0.2	0.57 J	0.035 B	0.22	0.042 B	<0.2	0.054 B	<0.2	121 J
Arsenic	0.011	0.09	0.0059 B	0.047	0.0035 B	0.018	0.017	<0.01	0.072
Barium	0.19 J	0.05 B	0.12 B	0.26	0.11 B	0.28	0.17 B	<0.2	0.76
Beryllium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0041 B
Cadmium	<0.005	0.00034 B	0.00044 B	0.00029 B	<0.005	<0.005	0.0004 B	<0.005	0.0033 B
Calcium	96.3	11.1	207	60.6 J	133	138	74	211	841
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.16
Cobalt	0.0025 B	0.016 B	0.0017 B	<0.05	0.0024 B	<0.05	<0.05	<0.05	0.069 J
Copper	0.021 B	0.0026 B	0.003 B	<0.025	<0.025	0.022 B	0.0026 B	<0.025	0.07
Iron	1.1 J	0.94	3.1	7.1	1.3	12.6 J	2.6	0.076 BJ	87.6
Lead	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.054
Magnesium	18.4	<5	69.2 J	13.5 J	16.3 J	33.7	13.6 J	118	25.3 J
Manganese	1.9 J	0.087 J	0.065	0.61	1.2	2.5 J	0.98	0.05 J	3.2 J
Mercury	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.000073 B	<0.0002	0.000059 B	<0.0002
Nickel	0.014 B	0.066	0.0088 B	0.0049 B	<0.04	0.0025 B	<0.04	<0.04	0.21
Potassium	<5	<5	7.7 J	<5	<5	<5	<5	<5	22.8 J
Selenium	<0.005	0.0078	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sodium	308	865	754	571	128	98.4	255	527	836
Thallium	<0.01	0.0095 B	0.0052 B	<0.01	<0.01	<0.01	0.0055 B	<0.01	<0.01
Vanadium	0.012 B	0.047 B	<0.05	0.0011 B	<0.05	<0.05	<0.05	<0.05	0.41
Zinc	0.024	<0.02	0.62 J	0.042 J	0.045 J	<0.02	0.22 J	0.4	0.35 J

Parameter	W-35 (4/21/04)	W-36 (4/21/04)	W-36S (4/20/04)	W-37 (4/22/04)	W-39 (4/22/04)	W-39S (4/20/04)	W-40 (4/20/04)	W-40D (4/19/04)	W-40S (4/19/04)	Spring (4/21/04)
Aluminum	<0.2	<0.2	0.085 B	<0.2	1.5 J	0.67	0.47	0.088 B	0.057 B	<0.2
Arsenic	0.031	0.013	<0.01	0.01	0.071	0.031	0.005 B	0.0033 B	0.023	<0.01
Barium	0.51	0.3	0.14 B	<0.2	<0.2	0.083 B	0.23	0.31	0.22	0.28
Beryllium	<0.005	<0.005	<0.005	<0.005	<0.005	0.00085 B	<0.005	<0.005	<0.005	<0.005
Cadmium	<0.005	<0.005	0.00031 B	<0.005	<0.005	0.00037 B	<0.005	<0.005	0.00033 B	<0.005
Calcium	152	129	105	31.4	290	368 J	105 J	99.1 J	105 J	146
Chromium	<0.01	<0.01	<0.01	<0.01	0.0049 B	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt	<0.05	<0.05	<0.05	<0.05	0.015 B	0.0014 B	<0.05	<0.05	<0.05	<0.05
Copper	<0.025	<0.025	0.0058 B	<0.025	0.0057 B	<0.025	<0.025	<0.025	<0.025	<0.025
Iron	13.3 J	6.7 J	0.52	0.96 J	104 J	18.4	5.9	0.26	5.1	1.8 J
Lead	<0.003	<0.003	<0.003	<0.003	0.06	<0.003	<0.003	<0.003	<0.003	<0.003
Magnesium	29.2	21	76.5 J	6.9	79.5	58.6 J	23.3 J	35.8 J	24.2 J	20.8
Manganese	1.8 J	1.6 J	0.03	1.3 J	5.1 J	2.4	2.4	0.24	0.52	0.86 J
Mercury	0.000056 B	0.000059 B	<0.0002	<0.0002	<0.0002	0.000035 B	<0.0002	<0.0002	<0.0002	<0.0002
Nickel	<0.04	<0.04	0.004 B	0.0043 B	0.015 B	<0.04	<0.04	0.0062 B	<0.04	<0.04
Potassium	<5	<5	26 J	<5	<5	<5	<5	11.2 J	<5	<5
Selenium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sodium	339	241	293	268	341	336	139	93.2	142	216
Thallium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	<0.05	<0.05	<0.05	0.0017 B	0.0068 B	<0.05	0.00088 B	0.001 B	<0.05	<0.05
Zinc	0.032 J	<0.02	0.059 J	0.023	0.82	0.25 J	<0.02	0.33 J	0.24 J	<0.02

Notes
- B = Estimated result. Result is less than the reporting limit.
- J = Method blank contamination. The associated method blank contains target analyte at a reportable level.
- Results in mg/L.

Well sample from **W-33** was also field filtered. The detected results are listed below.

Arsenic, Dissolved	4/22/04	0.048
Cadmium, Dissolved	4/22/04	0.00035 B
Calcium, Dissolved	4/22/04	6
Cobalt, Dissolved	4/22/04	0.0068 B
Iron, Dissolved	4/22/04	0.33
Magnesium, Dissolved	4/22/04	1.5 BJ
Nickel, Dissolved	4/22/04	0.048
Sodium, Dissolved	4/22/04	844
Vanadium, Dissolved	4/22/04	0.2

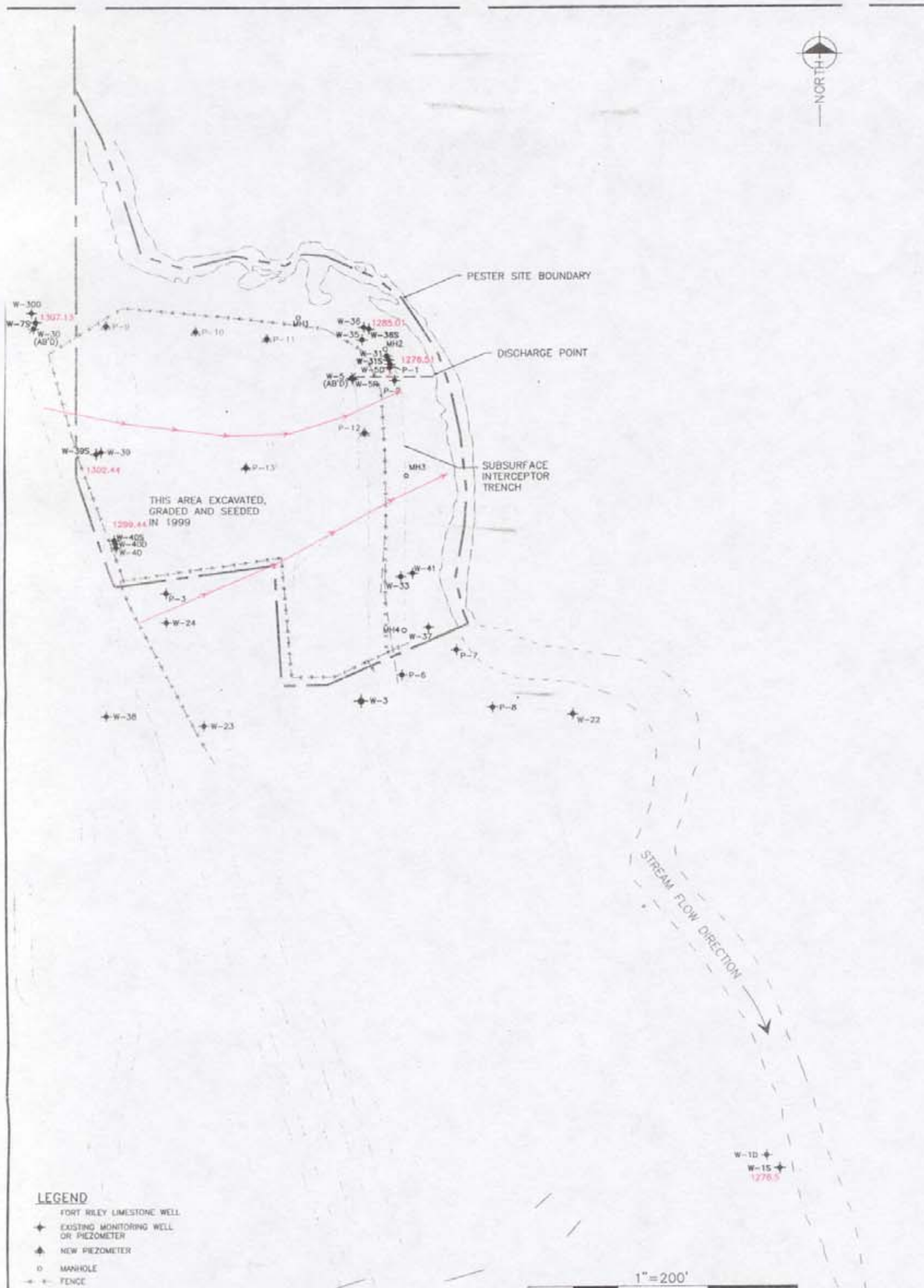


Project Reference: 0163
PESTER BURN POND SITE

1 ALLUVIAL/ERODED FORT RILEY UNIT POTENTIOMETRIC SURFACE MAP
2ND QUARTER 2004
APRIL 2004

Client: ATOFINA

SHARP AND ASSOCIATES, INC.



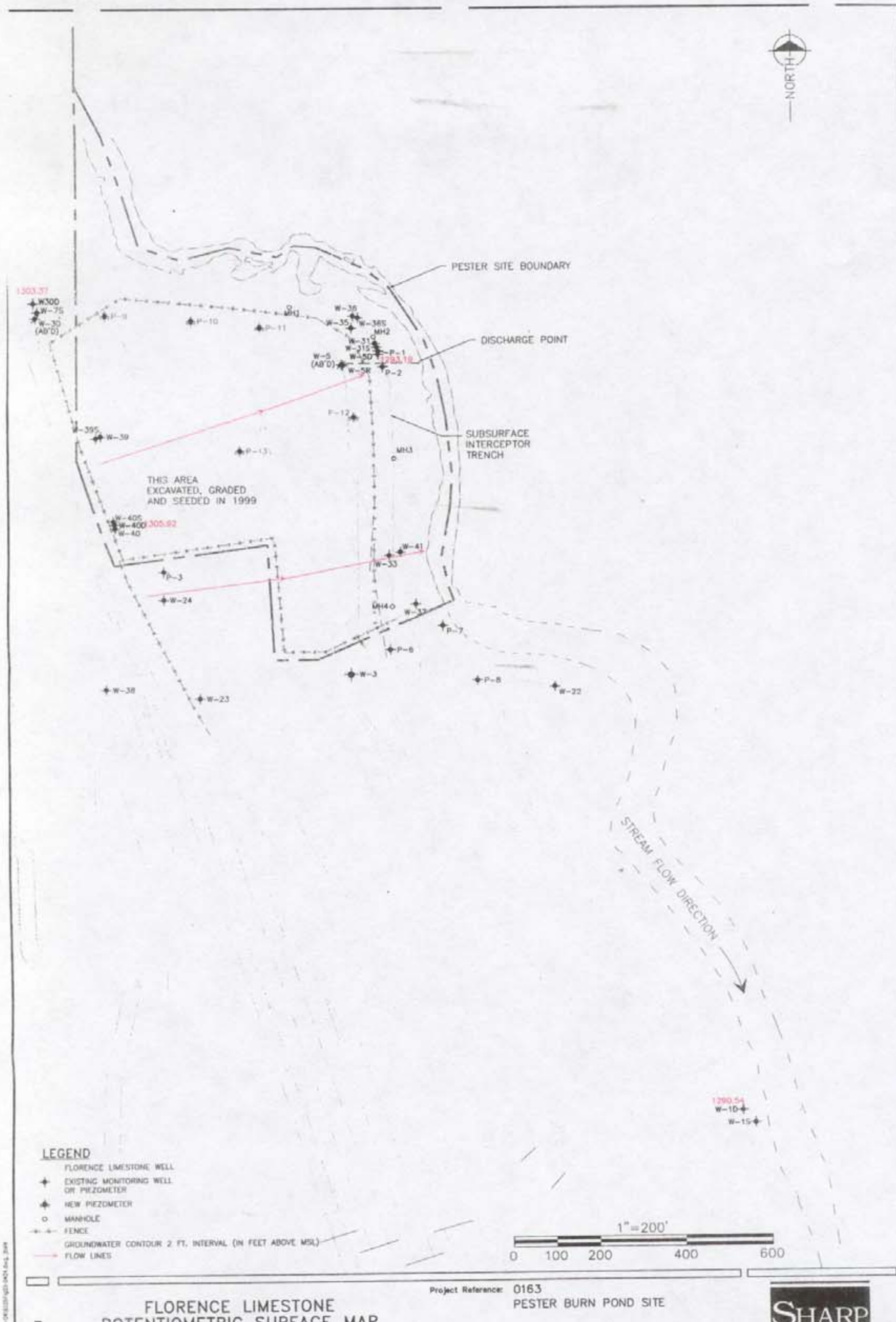
2

FORT RILEY LIMESTONE
POTENTIOMETRIC SURFACE MAP
2ND QUARTER 2004
APRIL 2004

Project Reference: 0163
PESTER BURN POND SITE

Client: ATOFINA

SHARP AND ASSOCIATES, INC.



Project Reference: 0163

PESTER BURN POND SITE

3

FLORENCE LIMESTONE
POTENTIOMETRIC SURFACE MAP
2ND QUARTER 2004
APRIL 2004

Client: ATOFINA

SHARP AND ASSOCIATES, INC.

ATTACHMENT 3

Site Photos


JUL 20 2004


JUL 20 2004